

Exam 3 Review

1. $f(x) = \frac{3}{x-6}$ Domain: $x-6 \neq 0$
 $x \neq 6$
 $\boxed{\{x \mid x \neq 6\} \text{ or } (-\infty, 6) \cup (6, \infty)}$

2. $f(x) = \frac{2x^2+5x}{x-3}$
 $f(-2) = \frac{2(-2)^2+5(-2)}{-2-3} = \frac{2(4)-10}{-5} = \frac{-2}{-5} = \boxed{\frac{2}{5}}$

3. $\frac{3x^2y^5}{6xy^8} = \frac{x}{2y^3} \cdot \frac{3xy^5}{3xy^5} = \boxed{\frac{x}{2y^3}}$

4. $\frac{x^2+5x-6}{x^2+2x-3} = \frac{(x+6)(\cancel{x-1})}{(x+3)(\cancel{x-1})} = \boxed{\frac{x+6}{x+3}}$

5. $f(x) = \frac{3-2x}{4x^2-9}$ $(2x+3)(2x-3) \neq 0$
 $x \neq -3/2, 3/2$

$f(x) = \frac{3-2x}{(2x+3)(2x-3)} = \frac{-(2x-3)}{(2x+3)(2x-3)}$
 $\boxed{f(x) = \frac{-1}{2x+3}, x \neq -3/2, 3/2}$

6. $\frac{x^2-4}{2x+6} \cdot \frac{x+3}{x^2+7x+10} =$
 $\frac{(x+2)(x-2)}{2(x+3)} \cdot \frac{\cancel{x+3}}{(x+5)(\cancel{x+2})} = \boxed{\frac{x-2}{2(x+5)}}$

7. $\frac{4x^3}{x^2-x-12} \div \frac{2x}{3x-12} = \frac{4x^3}{x^2-x-12} \cdot \frac{3x-12}{2x} =$
 $\frac{4x^3 \cdot 2x^2}{(x-4)(x+3)} \cdot \frac{3(\cancel{x-4})}{2x} = \boxed{\frac{6x^2}{x+3}}$

$$8. \frac{x^2 - 3x - 18}{6x} \div \frac{x+3}{x+6} \cdot \frac{x^2 - 6x}{x^2 - 12x + 36} =$$

$$\frac{x^2 - 3x - 18}{6x} \cdot \frac{x+6}{x+3} \cdot \frac{x^2 - 6x}{x^2 - 12x + 36} =$$

$$\frac{(x-6)(x+3)}{6x} \cdot \frac{x+6}{x+3} \cdot \frac{x(x-6)}{(x-6)(x-6)} = \boxed{\frac{x+6}{6}}$$

$$9. \frac{4}{x+y} + \frac{2x-1}{x+y} = \boxed{\frac{2x+3}{x+y}}$$

$$10. f(x) = \frac{x-1}{x^2+3x-40} - \frac{2x+15}{x^2+3x-40} \quad \begin{array}{l} x^2+3x-40 \neq 0 \\ (x+8)(x-5) \neq 0 \\ x \neq -8, 5 \end{array}$$

$$f(x) = \frac{(x-1) - (2x+15)}{(x+8)(x-5)}$$

$$f(x) = \frac{x-1-2x-15}{(x+8)(x-5)}$$

$$\boxed{f(x) = \frac{-x-16}{(x+8)(x-5)}, x \neq -8, 5}$$

$$11. \frac{x}{x-3} - \frac{2}{x+5} \quad \text{LCD: } (x-3)(x+5)$$

$$\left(\frac{x}{x-3} \right) \left(\frac{x+5}{x+5} \right) - \left(\frac{2}{x+5} \right) \left(\frac{x-3}{x-3} \right) =$$

$$\frac{x(x+5) - 2(x-3)}{(x-3)(x+5)} = \frac{x^2 + 5x - 2x + 6}{(x-3)(x+5)}$$

$$= \boxed{\frac{x^2 + 3x + 6}{(x-3)(x+5)}}$$

$$12. \frac{x+1}{x^2-2x-8} + \frac{2x+4}{x^2-16} = \frac{x+1}{(x-4)(x+2)} + \frac{2(x+2)}{(x+4)(x-4)}$$

$$= \left(\frac{x+1}{(x-4)(x+2)} \right) \left(\frac{x+4}{x+4} \right) + \left(\frac{2(x+2)}{(x+4)(x-4)} \right) \left(\frac{x+2}{x+2} \right)$$

$$= \frac{x^2 + 5x + 4 + 2x^2 + 8x + 8}{(x-4)(x+2)(x+4)} = \frac{3x^2 + 13x + 12}{(x-4)(x+2)(x+4)}$$

$$\begin{aligned}
 &= \frac{(3x^2 + 9x) + (4x + 12)}{(x-4)(x+4)(x+2)} \\
 &= \frac{3x(x+3) + 4(x+3)}{(x-4)(x+4)(x+2)} \\
 &= \boxed{\frac{(x+3)(3x+4)}{(x-4)(x+4)(x+2)}}
 \end{aligned}$$

$$\begin{array}{r|l}
 3x^2 + 13x + 12 & \\
 \hline
 3 \cdot 12 = 36 & 13 \\
 1, 36 & 37 \\
 2, 18 & 20 \\
 3, 12 & 15 \\
 \underline{4, 9} & 13 \\
 6, 6 & 12
 \end{array}$$

$$\begin{aligned}
 13. \quad \frac{3}{x-5} + \frac{2}{5-x} &= \frac{3}{x-5} + \frac{2}{-(x-5)} \\
 &= \frac{3}{x-5} - \frac{2}{x-5} = \boxed{\frac{1}{x-5}}
 \end{aligned}$$

$$14. \quad \left(\frac{\frac{5}{x} - \frac{3}{2y}}{\frac{1}{2x} + \frac{3}{y}} \right) \cdot \frac{2xy}{2xy} = \boxed{\frac{10y - 3x}{y + 14x}}$$

$$\begin{aligned}
 15. \quad \frac{\frac{6}{x^2-25} - \frac{1}{x-5}}{\frac{5}{x^2-25} + \frac{6}{x+5}} &= \left(\frac{\frac{6}{(x+5)(x-5)} - \frac{1}{x-5}}{\frac{5}{(x+5)(x-5)} + \frac{6}{x+5}} \right) \cdot \frac{(x+5)(x-5)}{(x+5)(x-5)} \\
 &= \frac{6 - (x+5)}{5 + 6(x-5)} = \frac{6 - x - 5}{5 + 6x - 30} = \boxed{\frac{-x + 1}{6x - 25}}
 \end{aligned}$$

$$\begin{aligned}
 16. \quad \left(\frac{2}{x} + \frac{5}{2x} \right) &= (3)^{(2x)} \quad x \neq 0 \\
 4 + 5 &= 6x \\
 9 &= 6x \\
 x &= \frac{9}{6} \\
 \boxed{x} &= \boxed{\frac{3}{2}}
 \end{aligned}$$

$$\begin{aligned}
 17. \quad \frac{2}{t} &= \frac{t}{5t-12} \quad t \neq 0 \quad 5t-12 \neq 0 \\
 &\quad 5t \neq 12 \quad t \neq \frac{12}{5} \\
 \left(\frac{2}{t} \right) (t) (5t-12) &= \left(\frac{t}{5t-12} \right) (t) (5t-12) \\
 10t - 24 &= t^2 \quad t^2 - 10t + 24 = 0 \quad (t-6)(t-4) = 0 \quad \boxed{\begin{matrix} t=6 \\ t=4 \end{matrix}}
 \end{aligned}$$

18. $\frac{6}{m-3} - \frac{9}{m+3} = \frac{3}{m^2-9} \quad m \neq 3, -3$

$$\left(\frac{6}{m-3} - \frac{9}{m+3} \right) (m+3)(m-3) = \left(\frac{3}{(m+3)(m-3)} \right) (m+3)(m-3)$$

$$6(m+3) - 9(m-3) = 3$$

$$6m + 18 - 9m + 27 = 3$$

$$-3m + 45 = 3$$

$$-3m = -42$$

$$\boxed{m = 14}$$

19. $\frac{y}{y+4} + \frac{8y+28}{y^2+7y+12} = \frac{4}{y+3} \quad y \neq -4, -3$

$$\left(\frac{y}{y+4} + \frac{8y+28}{(y+4)(y+3)} \right) (y+4)(y+3) = \left(\frac{4}{y+3} \right) (y+4)(y+3)$$

$$y(y+3) + 8y + 28 = 4(y+4)$$

$$y^2 + 3y + 8y + 28 = 4y + 16$$

$$y^2 + 11y + 28 = 4y + 16$$

$$y^2 + 7y + 12 = 0$$

$$(y+4)(y+3) = 0$$

$$y = -4 \text{ or } y = -3$$

no solution

20. $f(x) = 2x - \frac{5}{x} \quad f(a) = -3$

$$2a - \frac{5}{a} = -3 \quad a \neq 0$$

$$a(2a - \frac{5}{a}) = (-3)a$$

$$2a^2 - 5 = -3a$$

$$2a^2 + 3a - 5 = 0$$

$$(2a^2 + 5a) + (-2a - 5) = 0$$

$$a(2a+5) - 1(2a+5) = 0$$

$$(2a+5)(a-1) = 0$$

$$\boxed{a = -\frac{5}{2} \text{ or } a = 1}$$

$$2(-5) = \frac{-10}{3}$$

10, -1	9
5, -2	3

$$\begin{aligned}
 21. \quad x + 4\left(\frac{1}{x}\right) &= -5 & x \neq 0 \\
 x\left(x + \frac{4}{x}\right) &= (-5)x \\
 x^2 + 4 &= -5x \\
 x^2 + 5x + 4 &= 0 \\
 (x+4)(x+1) &= 0 \\
 \boxed{x = -4, -1}
 \end{aligned}$$

$$\begin{aligned}
 22. \quad \frac{t}{a} + \frac{t}{b} &= 1 & \text{Martha: 3 hrs} & \text{together: ?} \\
 & & \text{brother: 5 hrs} & \\
 (15)\left(\frac{t}{3} + \frac{t}{5}\right) &= (1)(15) \\
 5t + 3t &= 15 \\
 8t &= 15 \\
 t = \frac{15}{8} &= \boxed{1.875 \text{ hrs}}
 \end{aligned}$$

$$\begin{aligned}
 23. \quad \text{Jeff: 5 hrs longer than Bill} & \quad J = B + 5 \\
 \text{together: 6 hrs} & \\
 \frac{t}{a} + \frac{t}{b} &= 1 & \frac{6}{B+5} + \frac{6}{B} &= 1 \\
 B(B+5)\left(\frac{6}{B+5} + \frac{6}{B}\right) &= (1)(B)(B+5) \\
 6B + 6(B+5) &= B^2 + 5B \\
 6B + 6B + 30 &= B^2 + 5B \\
 12B + 30 &= B^2 + 5B \\
 B^2 - 7B - 30 &= 0 \\
 (B-10)(B+3) &= 0 \\
 \boxed{B = 10 \text{ hrs}}
 \end{aligned}$$

24.

	d	r	t
upstream	4 4	$7-c$	$t = \frac{4}{7-c}$
downstream	10 10	$7+c$	$t = \frac{10}{7+c}$

$$d = rt \quad t = \frac{d}{r}$$

$$\frac{4}{7-c} = \frac{10}{7+c}$$

$$(7+c)(7-c) \left(\frac{4}{7-c} \right) = \left(\frac{10}{7+c} \right) (7+c)(7-c)$$

$$4(7+c) = 10(7-c)$$

$$28 + 4c = 70 - 10c$$

$$14c = 42$$

$$c = 3$$

$$\boxed{3 \text{ mph}}$$

25.

	d	r	t = d/r
upstream	45	r $r-3$	$\frac{45}{r-3}$
downstream	45	$r+3$	$\frac{45}{r+3}$

$$\frac{45}{r-3} + \frac{45}{r+3} = 8$$

$$(r-3)(r+3) \left(\frac{45}{r-3} + \frac{45}{r+3} \right) = 8(r-3)(r+3)$$

$$45(r+3) + 45(r-3) = 8(r^2 - 9)$$

$$45r + 135 + 45r - 135 = 8r^2 - 72$$

$$90r = 8r^2 - 72$$

$$8r^2 - 90r - 72 = 0$$

$$2(4r^2 - 45r - 36) = 0$$

$$4r^2 - 45r - 36 = 0$$

$$(4r^2 - 48r) + (3r - 36) = 0$$

$$4r(r-12) + 3(r-12) = 0$$

$$(r-12)(4r+3) = 0$$

$$r = 12 \text{ or } r = -3/4$$

$$\boxed{12 \text{ mph}}$$

$$\begin{array}{r} 4(-36) = -144 \quad | \quad -45 \\ -144, 1 \quad | \quad -143 \\ -72, 3 \quad | \quad -70 \\ -48, 3 \quad | \quad -45 \end{array}$$

$$26. \frac{-10x^3y^2 + 2x^2y^3 + 4xy^2}{-2x^2y} =$$

$$\frac{-10x^3y^2}{-2x^2y} + \frac{2x^2y^3}{-2x^2y} + \frac{4xy^2}{-2x^2y} =$$

$$\boxed{5xy - y^2 - \frac{2y}{x}}$$

$$27. (5m^2 + 37m - 72) \div (m + 9)$$

$$\begin{array}{r} 5m - 8 \\ m+9 \overline{) 5m^2 + 37m - 72} \\ \underline{+ (-5m^2 + 45m)} \\ -8m - 72 \\ \underline{+ (8m + 72)} \\ 0 \end{array}$$

$$\boxed{5m - 8}$$

$$28. (p^2 + 2p - 8) \div (p + 5)$$

$$\begin{array}{r} p - 3 \\ p+5 \overline{) p^2 + 2p - 8} \\ \underline{+ (-p^2 + 5p)} \\ -3p - 8 \\ \underline{+ (3p + 15)} \\ 7 \end{array}$$

$$\boxed{p - 3 + \frac{7}{p+5}}$$

$$29. (2r^3 + 5r^2 - 13r - 10) \div (r - 2)$$

$$\begin{array}{r} 2r^2 + 9r + 5 \\ r-2 \overline{) 2r^3 + 5r^2 - 13r - 10} \\ \underline{+ (-2r^3 + 4r^2)} \\ 9r^2 - 13r \\ \underline{+ (-9r^2 + 18r)} \\ 5r - 10 \\ \underline{+ (-5r + 10)} \\ 0 \end{array}$$

$$\boxed{2r^2 + 9r + 5}$$

$$30. \frac{-4x^3 - 10x^2 - 2x + 16}{2x+1}$$

$$\begin{array}{r} -2x^2 - 4x + 1 \\ 2x+1 \overline{) -4x^3 - 10x^2 - 2x + 16} \\ + (+4x^3 + 2x^2) \end{array}$$

$$\begin{array}{r} -8x^2 - 2x \\ + (+8x^2 + 4x) \end{array}$$

$$\begin{array}{r} 2x + 16 \\ + (-2x + -1) \\ \hline 15 \end{array}$$

$$\boxed{-2x^2 - 4x + 1 + \frac{15}{2x+1}}$$

$$31. I = \frac{2V}{R+2r}, \text{ for } r$$

$$I(R+2r) = 2V$$

$$IR + 2Ir = 2V$$

$$2Ir = 2V - IR$$

$$\boxed{r = \frac{2V - IR}{2I}}$$

$$32. \frac{1}{a} + \frac{1}{b} = \frac{1}{t}, \text{ for } t$$

$$abt \left(\frac{1}{a} + \frac{1}{b} \right) = \left(\frac{1}{t} \right) abt$$

$$bt + at = ab$$

$$\cancel{abt} + (b+a)t = ab$$

$$\boxed{t = \frac{ab}{b+a}}$$

$$33. L = \frac{dR}{D-d}, \text{ for } d$$

$$L(D-d) = dR$$

$$LD - Ld = dR$$

$$LD = dR + Ld$$

$$LD = d(R+L)$$

$$\boxed{d = \frac{LD}{R+L}}$$

$$34. P = \frac{A}{1+r}, \text{ for } r$$

$$P(1+r) = A$$

$$1+r = \frac{A}{P}$$

$$\boxed{r = \frac{A}{P} - 1}$$

or

$$\boxed{r = \frac{A-P}{P}}$$